OPTIONS FOR DEVELOPMENT COOPERATION IN IT EDUCATION AND TRAINING: THE ZIMBABWE CASE

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Abstract: This paper attempts to address the need and justification for a Computer Skills Requirements Model for Zimbabwe as well as the findings and plans following the recently completed Zimbabwe Computer Industry Manpower Survey. It then focuses on the need for development cooperation in the areas of computer education, training, consultancy, research and institutional capacity building. In this regard, jobs and job categories, the education and training systems, equipment and others are discussed as potential areas for rationalisation if the above objective is to be met. The paper also suggests strategies for cooperation such as networking to mutually strengthen the capacities of the key players. It goes further to suggest a need for policies to provide the enabling environment. Central units that advise governments is proposed which acts as a clearing houses and have the mandate to manage, standardise and look outwards to monitor trends and developments in the Information Technology (IT) scenario.

Keywords: Computer Skills Requirements Model, Zimbabwe, Manpower Survey, Development Cooperation, Strategies.

1. GREETINGS

Distinguished participants, presenters, ladies and gentlemen.

A very good day to you all.

Firstly, I would like to thank the organising committee for inviting me to address you this morning. It is a great honour.

Secondly, I bring greetings from the Director General of ESAMI, Professor Gufwoli and the President of the Computer Society of Zimbabwe, Mr Lawrence Gudza.

2. DEFINITION OF KEY TERMS

SKILL could mean:

COMPETENCE, PROFICIENCY, MASTERY, ABILITY or CAPACITY.

DEVELOPMENT could mean:

positive ADVANCEMENT, IMPROVEMENT, INCREASE, PROGRESS or GROWTH from some undesired status. It is the interim period whilst converting from undesired negative

valued situations to a positive valued position.

COOPERATION could mean:

COLLABORATION, PARTICIPATION, TEAMWORK, INTERACTION with other players to achieve a desired situation.

DEVELOPMENT COOPERATION therefore could be said to mean:

The transition from an undesired state to a desired position through embarking on a specific programme of events that are measurable, acceptable to the key players, realistic in nature and are timebound.

3. THE SKILLS REQUIREMENTS MODEL (SRM)

3.1. BACKGROUND AND JUSTIFICATION TO SETTING UP THE SRM

The need for a Zimbabwe computer skills requirements model was identified following:

- Professor Crossman's presentation in the early 90's and last year at our Summerschool.
- A study done by Professor William Luebbert in 1991 on behalf of the Computer Supplier's Association (COMSA) who identified seven primary skills or professional function areas in the Zimbabwe Computer Industry namely:

  (a) SOFTWARE AND PROGRAMMING

  (b) BUSINESS APPLICATIONS

  (c) COMPUTER ENGINEERING

  (d) INFORMATION SYSTEMS

  (e) DP OPERATIONS

  (f) SPECIALIST AREAS AND

  (g) ADJUNCT AREAS (See ANNEX 'A')

  Refer to Attachment #1.

- Secondly, ideas generated following an update I received from other country presentations and discussions held when I represented the Computer Society of Zimbabwe (CSZ) in Singapore (1992) at an IFIP TC3 working group 3.4 conference and members meeting;

- Thirdly, further analysis in 1992 by the CSZ council education committee which did show that, of the skills areas in Professor Luebbert's report, only Software and Programming, Information Systems and Business Applications were partly addressed by the currently nationally recognised computer programmes; and

- Finally, a review of the key performance standards or outputs set by CSZ at its 1993 annual planning meeting at Kadoma.

From the observations referred above, it was understood that:

- A number of training institutions needed guidance to what skills are required by industry for them to develop and run relevant courses in order to bridge the mismatch between existing training programmes and labour market demands;

- Government needed advice from the experts as to the critical areas for national manpower development in the computer industry;

- The public needed reliable advice as to which computer training programmes to attend for employment out of the many offered by the local computer training institutions;

- The employers needed guidance as to what standards to employ for recruitment, promotion, etc. for computer professionals; and that

- There was a shortage of computer professionals both in terms of quantity and quality in the Zimbabwe computer industry. This was attributed to:

  (a) The ongoing automation in business and government, educational and other institutions which requires an increasingly extensive, sophisticated and diversified use and maintenance of computers; and

  (b) The rapid expansion of current information technologies which have created a situation in which a rapidly increasing amount of work needs to be done to operate and maintain the technologies.

It was in recognition of the above concerns that a request was made by CSZ to NAMACO for financial support on a project to address the above problems. The project was to use the services of a consultant to do a similar exercise as was done by Professor William Luebbert but this time addressing the whole industry (not just computer engineering) in the shortest possible time (35 days). The expected outputs from the exercise was to be an Education and Training Planning and Development Handbook or Guide which would include:

- The computer industry skills requirement model incorporating all professional/functions or skills areas and levels;

- A standard career path model for schools/public for career guidance;

- A Continuous Professional Development (CPD) scheme for CSZ members to improve their updatedness or currentness with the very dynamic computing technologies on the local market; and

- A stocktake report of computer training offered in Zimbabwe as well as other external training used by Zimbabweans.

NAMACO in liaison with the Ministry of Higher Education (MOHE) approved the use of the Zimbabwe Manpower Development Fund (ZIMDEF) funds for the project but using a different approach, as the legislation could not allow use of the funds for consultancy fees, i.e. the IT Manpower Survey. A task force was set up with a role of collecting data from the Zimbabwe computer industry, analyse and put forward recommendations for ratification by CSZ and government for computer professionals training and development. I was privileged to chair this task force.

3.2. OUR APPROACH TO SETTING UP THE ZIMBABWE COMPUTER INDUSTRY SRM

In setting up a standard computer industry skills requirements model our belief was that the following had to happen:

- Firstly, that the standard professional functions movements or trends had to be monitored through surveys or studies i.e. on skills areas, levels as well as job titles in use on the market. A summary of the findings of the computer industry manpower survey conducted in 1994 will be presented next in this paper;

- Secondly that the standard computer products and services movements or trends had to be monitored through studies and surveys as well if the industry is to keep pace with changes in the environment as well as technology. Our survey did not address this area and hence it is our intention to look at this in the next one; and

- Thirdly, that the CSZ professional membership model had to be reviewed and updated to take cognisance of

  (a) the need to improve the updatedness or currentness of members as well as their participation in CSZ activities as currently all CSZ activities are run on a voluntary basis, and

  (b) the need for an examination mechanism may have to be put in place by the Society for professional membership of the Society initially centred around the defined codes of ethics/practice.

3.3 THE MANPOWER SURVEY '94

Chairperson, ladies and gentlemen, I would now like to take this opportunity to share with you a summary of our findings and some analysis of the 1994 Computer Industry Manpower Survey.

The Survey results may be subject to considerable controversy and debate as the data is based on a sample of 58 out of 180 questionnaires that were dispatched. Secondly, the findings I will present do not necessarily take into account of extrapolations and further analysis that still has to be done before a final report is produced. The extrapolations of the sample projections will have to be done in order that we have reasonably accurate figures for input into the national manpower planning process.

- The following was the ***distribution of the respondents*** by economic sector with the majority representing Business Services sector with 22%.

Refer to Attachment #2

- The sample survey results showed that there were 1202 ***computer personnel*** employed by the 58 ***organisations*** and that the majority 50% work in local private firms.

Refer to Attachment #3

- On ***gender analysis***, males outnumbered females overall by 28%. NB. Women account for 51% of the total population of Zimbabwe.

Refer to Attachment #4

- The ***majority*** of the computer industry appear to be ***concentrated*** in the Business Services (31%), Public Administration (26%) and Communications (10%). Sectors with the least number was found in Manufacturing (1%).

Refer to Attachment #5

- In 1993 alone a total of 104 personnel left their organisations for reasons we did not bother to ask in the questionnaire compared to 170 new recruits over the same period. The highest turnover rate of 12% was registered in local private firms and the government institutions had the lowest turnover rate of 3% over the same period. A similar trend of 21% and 5% respectively was recorded on the number of IT personnel recruited giving a net gain of 66 for all the responding firms in 1993.

Refer to Attachment #6

- Looking at ***staff turnover*** by industrial sector it was observed that the Manufacturing sector had the highest turnover rate of 70% and net loss whilst the Agriculture sector had the lowest rate of 2%. Of the total IT personnel absorbed during 1993, Business Services accounted for about 50% of new arrivals.

Refer to Attachment #7

- On ***skills distribution***, data collected was analysed under seven major sections or professional functions of Software and Programming, Business Applications, Computer Hardware, Information Systems, DP Operations, Specialist and Adjunct Skills at high, middle and low levels.

- The ***employee distribution*** showed a higher concentration ***in professional functions*** of DP Operations, Business Applications and Software and Programming which between them accounted for more than 50% of computer personnel employed by the responding firms.

- A significant number of the employed IT personnel was registered in the low and middle levels. Only in the areas of Information Systems and Specialist Skills where their significant proportions of high level skills.

Refer to Attachment #8.1

Refer to Attachment #8.2

- The ***projected requirements for computer skills*** for period 1995 to 1998 shows most dramatic increases expected in Adjunct Skills (hybrid type person) particularly in the public sector. High level manpower requirements are expected to increase in Business Applications and DP Operations.

Refer to Attachment #9

Refer to Attachment #10

Refer to Attachment #11

- On the ***demand patterns for IT skills*** which is going to be the basis for our skills requirements model we only requested respondents to inform us on major skills that must be known for each professional function as well as levels and other details. In addition we requested under each level for each skills area the job titles normally used for personnel in the industry. The feedback assisted us in the formulation of a career path model.

Refer to Attachment #12

Refer to Attachment #13

4. DEVELOPMENT COOPERATION

4.1. THE NEED FOR DEVELOPMENT COOPERATION

Ladies and Gentlemen, I believe that before one can talk about development cooperation, there must exist a common desire and aspiration to put some infrastructure in place for use by group members to solve existing problems or assist them in achieving their personal goals and objectives. The process of cooperation for development in IT education and training begins with the identification of suitable or acceptable areas of concern given the direction or path a country wishes to follow. The definition of that path needs guidance from the leadership of a country through some manpower development mission, goals and objectives.

Our Zimbabwe computer industry is currently guided by the following:

(a) To provide direction and guidance in meeting computer education and training needs of the information processing industry of Zimbabwe;

(b) To review and update the educational and other requirements for membership of CSZ;

(c) To lay down standards and procedures for the accreditation of the information processing training institutions of Zimbabwe; and

(d) To lay down standards and procedures for the accreditation of courses offered by the information processing training institutions of Zimbabwe.

4.2 KEY PLAYERS TO GUARANTEE OR GUIDE THAT DEVELOPMENT COOPERATION

The players under the microscope could be schools, institutes, universities and industries. To establish some linkages for any form of cooperation, the parties interests, expectations, mandates, fears and consequences of their potential must be understood and methods to address investigations. I will refer to this first prerequisite as PARTICIPATION ANALYSIS.

4.3 AREAS OF COOPERATION TO ASSURE SUSTAINABILITY OF IT EDUCATION AND TRAINING

Areas of cooperation evolving from problem analysis as well as objective analysis of key players will be addressed in this order in my presentation:

ASSISTANCE IN STAFF DEVELOPMENT

JOINT DESIGN AND DELIVERY OF COURSES

LECTURER LENDING

STUDENTS ATTACHMENT IN INDUSTRY

EMPLOYMENT AND CONVERSION TRAINING

CAREER GUIDANCE

ASSISTANCE FOR CAPACITATION AND INSTITUTIONAL CAPACITY BUILDING

RESEARCH ASSISTANCE

JOINT VENTURES

CONSULTANCY

PROFESSIONALISM

NETWORKING

On ASSISTANCE IN STAFF DEVELOPMENT, secondment of lecturers in industry for familiarisation with the real business world is highly essential. A lot of lecturers in institutions of higher learning do not know about industrial work ethics or standards and hence cannot impart all the necessary skills required by student to seek for employment after graduation. This is not effectively practised in Zimbabwe.

JOINT DESIGN AND DELIVERY OF COURSES is another area for cooperation. Participation by industrialists in Examinations, Syllabi and Materials development is prerequisite to successful development cooperation in computer education and training. In Zimbabwe, the committee structures set up by the Ministry of Higher Education's Curriculum and Development Unit in conjunction with industry are intended to address this requirement. Such involvement by interested parties will promote acceptance and commitment by the players involved.

The third is LECTURER LENDING where industry releases its staff to teach on a part time basis in institutions of higher learning in areas where they are experts. In Zimbabwe, if an organisation releases its staff to assist in training, the Zimbabwe Manpower Development Fund (ZIMDEF) will pay the organisation for the time at the equivalent of their normal hourly pay rate. In addition, the member of staff concerned will be paid a part time fee by the same Fund for his or her efforts. Every private sector organisation in our country pays 1% of their total salary bill into ZIMDF to be used for the development of skilled manpower according to Subsection (2) of Section 47 of the Manpower Planning and Development Act of 1994. Although the computer industry has not yet made the best of the Fund, it prescribes to the gesture or incentives to guarantee quality and relevant training in the institutions of higher learning.

The rate of change of technology as well as range of different systems used by organisations, public and private sector is such that no one institution can afford to buy or stock different kind of systems or technologies to manage the skills development process for the field of information technology. There is therefore, need for a dual system of education and training coupled with some incentives to lure particularly industry into participating willingly in this national cause without necessarily hindering the achievement of their organisational objectives. With this in plant programme or dual system, college students are ATTACHED IN INDUSTRY as part of the training for a specified period. In Zimbabwe, we have a system of approved training eligible rebates from the ZIMDEF fund mentioned earlier. Employers who provide on-the-job training and attachment opportunities for students undertaking recognised training are awarded a rebate of some form from the fund. Besides that there is a hidden advantage for employers in participating in this exercise. An organisation has an opportunity to assess students for possible future employment and even be in a position to guide them on career opportunities with requirements within the operation where the student is attached.

There is a dire need for incentives to get the employer community to participate in EMPLOYMENT AND CONVERSION TRAINING for college leavers. The employment of fresh graduates and giving time for adjustment to the job environment will also provide to the employer an opportunity for selection for future employment. It would also bridge the gap of experience which in most organisations is prerequisite for employment. The Confederation of Zimbabwe Industries (CZI) is currently testing a cadet programme mainly for business occupations which incorporates computers. This venture is also being pursued by the Institute of Engineers of Zimbabwe.

CAREER GUIDANCE (referred to earlier on justification of the SRM) for students is recommended as the sixth option for development cooperation between industry and schools, institutes or universities but requires inside knowledge of where opportunities are on the computer market as well as the job requirements in terms of education and skill proficiencies. Mostly, new graduates have very high expectations with regards to salaries job requirements and positioning when they leave college or university. It is highly necessary that they are informed of what to expect in the different areas of IT before they select a career to pursue.

The seventh dimension to development cooperation is ASSISTANCE FOR CAPACITATION AND INSTITUTIONAL CAPACITY BUILDING. This could be presented in the form of leasing premises, equipment, special tools for training activities and management purposes to schools and institutions of higher learning. For capacitation or institutional capacity building, organisations with resources that can be used in the development of IT education and training and are not being fully utilised, are encouraged to share the resources. Besides ensuring better utilisation, this could be used for revenue generation for maintenance and other running costs. In this regard, a school or college which is privileged to have computing resources such as manpower, computers, etc. could lease time or offer training services to schools or colleges close-by and in that way build their capacity. Such networking would promote specialisation thereby guaranteeing provision of quality service by providers of education and training.

There is need for institutions to market the services the offer to increase usage or utilisation of resources besides increase in revenue for other development projects. This involves lectures, presentations at conferences, etc.

In RESEARCH ASSISTANCE as an option, employees should be given the opportunity to go and investigate or do research at local universities in areas where problems and challenges in the business require full time effort to analyse. Where quality matters and the need for decisions made need to be based on fact this becomes a very viable alternative. Besides, it would help built the individual professional and intellectual capacity.

JOINT VENTURES/STRATEGIC ALLIANCES should be investigated for specialisation and capacitation of players in the field of computer education and training. It is however important to note the importance of transparency as a key feature or pre-condition for well perceived ownership and commitment at all levels of parties involved.

CONSULTANCY should also be considered as a factor of development cooperation. The importance of tapping and keeping the so scarce resources taking into account the opening up of South Africa and other neighbouring countries requirements cannot be overly stressed. Use of pensioners on a consultancy basis in colleges, schools, institutes and industry gives an opportunity to the young folk to learn from experience of others about the work environment. PROFESSIONALISM is key to successful development cooperation in IT education and training. In this regard, practical on-the-job training could be considered for membership of professional bodies. Also Continuous Professional Development could be made mandatory for the retention of professional body membership grades. The development of codes of ethics/practise is an important dimension for the promotion of professionalism. the Computer Society of Zimbabwe through its council education committee is investigating this option for possible implementation soon.

The last area I would like to pursue is NETWORKING or linkages for better utilisation of resources, reduce wastage and duplication and finally sustainable development. It is in this way that capacitation of our training establishments could be achieved quicker and cheaper. The Computer Society of Zimbabwe portfolio charters such as "External Liaison" and "Internal Liaison" for its education and training committee help address this requirement.

The external liaison standard requires that contact is established and maintained with a certain number of reputable regional and international bodies to identify new developments in the field of computer education and training which are appropriate to Zimbabwe. This standard has been achieved through linkages with IFIP TC3 and its working groups, the British Computer Society and others. We are benefiting a lot through frequent visits and correspondence from all over the world through this network. Most of my education and training committee members are correspondence members of the various IFIP TC3 working groups addressing elementary, secondary and tertiary schools, teachers etc.

The internal liaison standard requires that contact is established and maintained with appropriate government institutions, professional bodies, accredited training establishments, etc. in order to monitor that identified industry needs are being addressed. The problem with this standard has always been that the industry training needs had not been clearly defined for us to use as a 'yardstick'. The Skills Requirements Model project referred to earlier in my paper should help set the pace in meeting the standard. The network has however been established. Members of the Computer Society of Zimbabwe sit in the National Manpower Advisory Council (NAMACO), College Advisory Councils, Ministry of Higher Education committees for curriculum and examinations (for locally examined diploma programmes), etc.

I would like at this juncture to explain this NAMACO body I refer to in my presentation. To effectively monitor and evaluate the IT education and training system, there is need to build and maintain a central unit that will design, analyse, manage, repackage, search, translate, refer to, etc. related look at the current trends, see whether the local capacity can benefit, then advise government on the way forward with regards to IT education and training standards. In Zimbabwe a similar body is in place at the level of influencing government policy on manpower issues called the National Manpower Advisory Council (NAMACO). This is a council appointed by the President of Zimbabwe under advisement from the

Minister of Higher Education with recommendations coming from the private sector representative organisations such as the Confederation of Zimbabwe Industries (CZI), the Zimbabwe National Chamber of Commerce (ZNCC), the Computer Society of Zimbabwe (CSZ), and others. I represent CSZ in this council. This body which is totally private sector, through its networks determines the future direction for education and training on advice from the respective bodies they represent and advises the minister accordingly for his decision and action.

5. CONCLUSION

In conclusion

- IT professionals should be responsible for their own professional development and are therefore expected to take the initiative to broaden their knowledge and to perfect their technical skills.

  'It is better to have CSZ members with 1 year of 5 years experience than 5 years of 1 year experience.'

- The CPD scheme is intended to act as a catalyst for the professional development to take place.

  'You can make a horse go to the well but you cannot necessarily make it drink the water.'

- The skills requirements model is constructed around a set of seven knowledge and skill layers.

  Each layer contains concepts, methods and technical aspects that a computer professional should have in a particular discipline in order to effectively cope with problems concerned with the development and operation of new computer applications.

  Sir Francis Drake once said:

  'There must be a beginning of any great matter, but the continuing unto the end until it be thoroughly finished yields true glory.'

6. ACKNOWLEDGEMENTS

I am most grateful to NAMACO and Ministry of Higher Education for their facilitation re: funds to develop the skills requirement model.

I am also grateful for the stimulus provided by my colleagues in the Council Education Committee, the Skills Requirement Model task force.

I wish to gratefully acknowledge Chipo Garwe for comments and typing.

6. REFERENCES

1. Report by Research Department (Ministry of Higher Education).
2. Bill Luebbert's Report.
3. *Channeling to Education by skill definition models*, Computer Division (Training Department), HITACHI Limited.
4. 1994 CSZ APM Resolutions.

	INTERESTS	EXPECTATIONS	FEARS	REACTION IMPACT
SCHOOLS	Trainable and possibly employable students	Career guidance from industry. Visits to place of work. Support on cash or in kind.	Raise hopes/expectations beyond deliverables.	
INSTITUTES	Acceptance by industry	Attachment of staff and students by industry Employment of students by industry.	Loss of skilled manpower to industry.	
UNIVERSITIES	Building intellectual capacity External recognition.	Research Projects from industry.	Political interference and loss of academic freedom.	Strikes - retardation of progress in education system
INDUSTRY	Return on investment	Productive manpower	Controls/legislature that stifles innovation and creativity	Unemployment.

ATTACHMENT #1

PRIMARY SKILLS OR PROFESSIONAL FUNCTION AREAS

Computer Engineering

The technology of computer hardware. Emphasis is on installations, repairs and maintenance of computer systems.

Software and Programming

The technology of programming and software. Emphasis is on knowledge of various computer languages and programming techniques and in how to apply and use them.

Information Systems

The organisation of hardware/software operations systems. This emphasizes on the development and maintenance of Business Systems. Experts are required to develop customised computer systems to meet needs to particular business.

Business Applications

The effective adaptation and use of sophisticated application systems to include database packages, spreadsheets, word processors, desk-top publishing, graphic packages, etc. Emphasis is on the ability to apply and use such discrete packages in customising systems through use of templates, macros, etc.

DP Operations

The operations and management of data processing facilities and services centres to include data capture and quality control, processing and to meet users needs and schedules, etc. It emphasizes on the organisation and operation of computer facilities within the organisation.

Specialist Skills

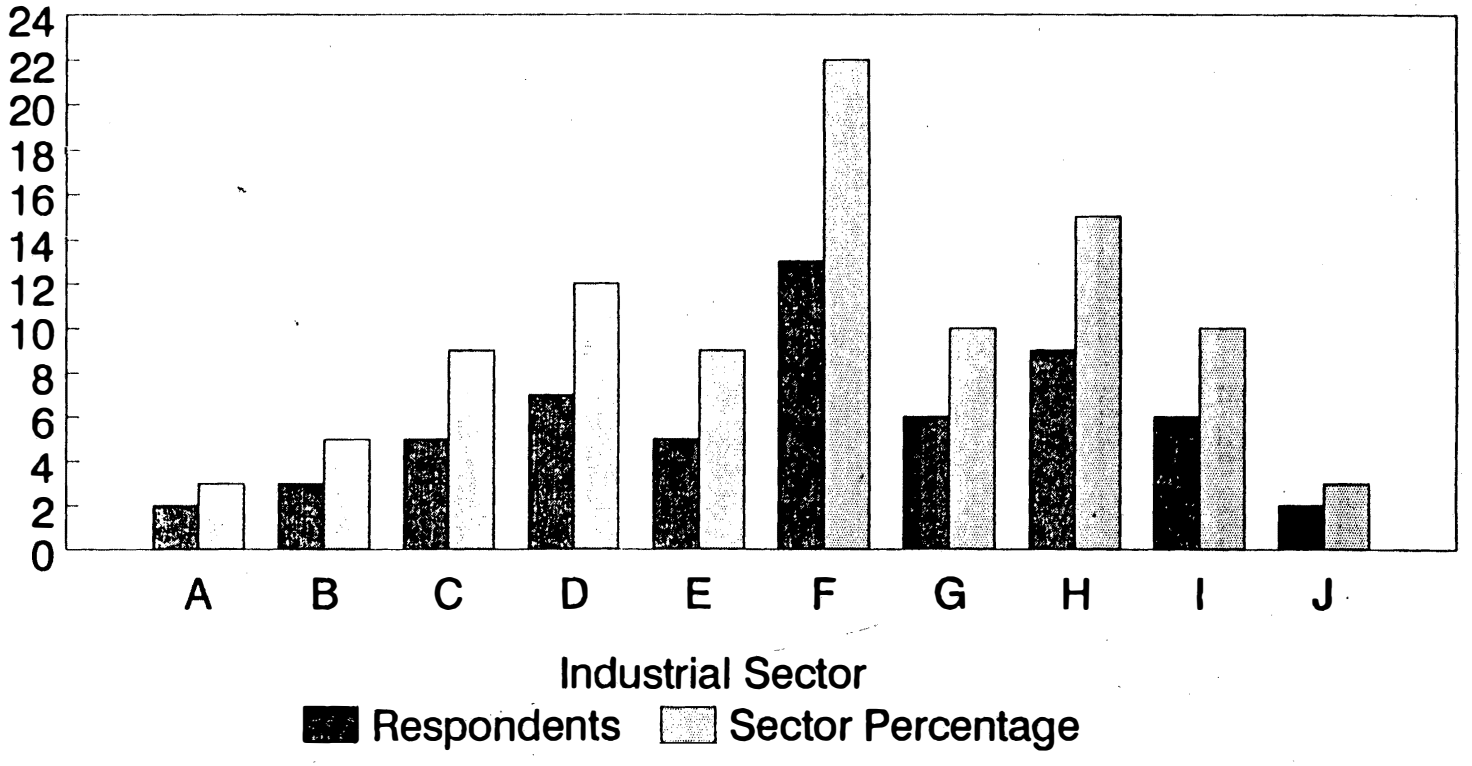
The non-mainstream computer specialties which require a high degree of professional computer knowledge, requires a very specialised kind of knowledge which may not fit into one of the above categories. One must have one of the above skills as prerequisite to enter this category. Examples are EDP auditing, security, quality control, data communications and networking, etc.

Adjunct Skills Areas

Applicable to personnel with limited computer technical but work within the company industry in non-technical management and support functions. These areas are evaluated not on computer technical skills but experience and responsibility. Admission to these jobs in this area are dependent in at least minimum level of computer technical knowledge and abilities, eg. management, sales and marketing, training and consultancy.

Attach #2

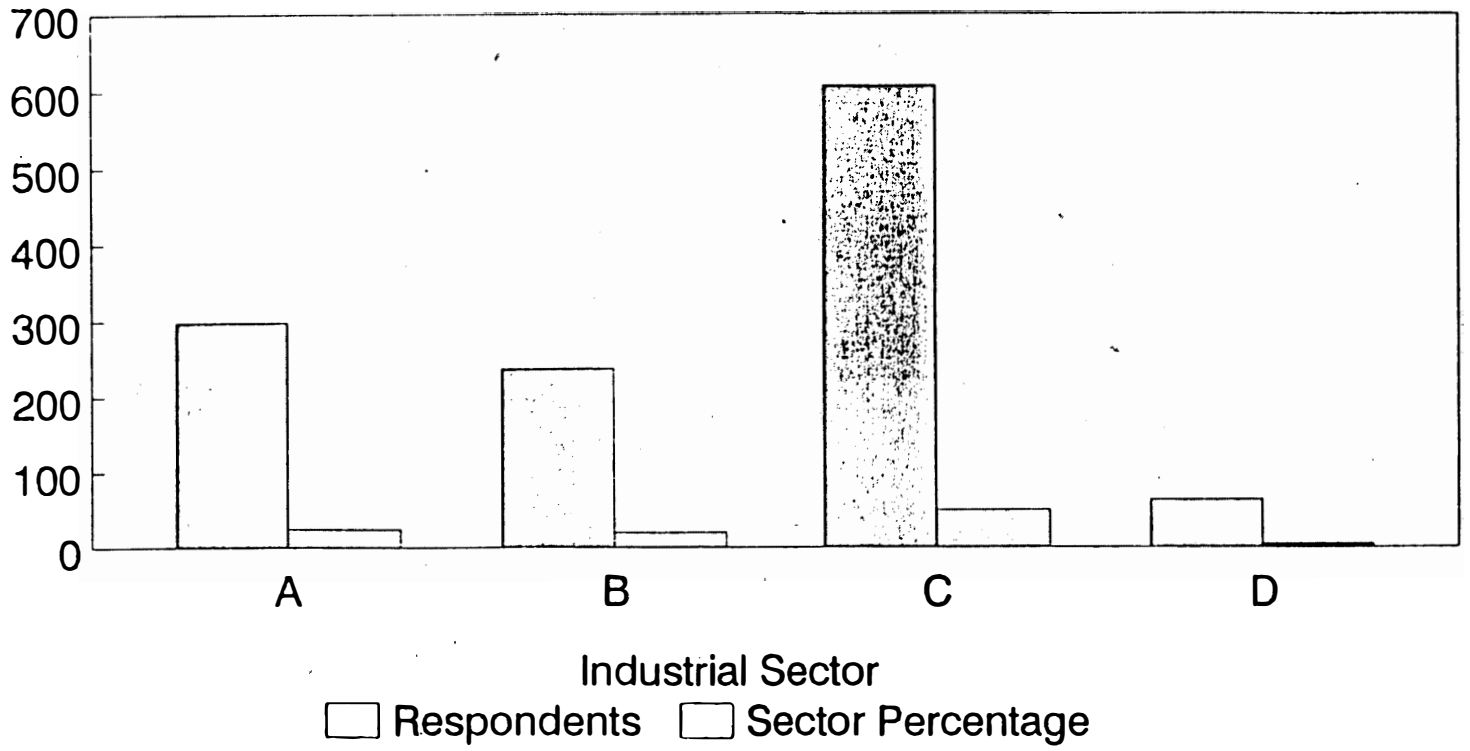
RESPONDING ORGN BY ECONOMIC SECTOR



A – Agriculture B – Mining C – Manufacturing D – Commerce E – Communications
F – Business Serv. G – Banking & Finance H – Education I – Public Admin.J – Other

Attach #3

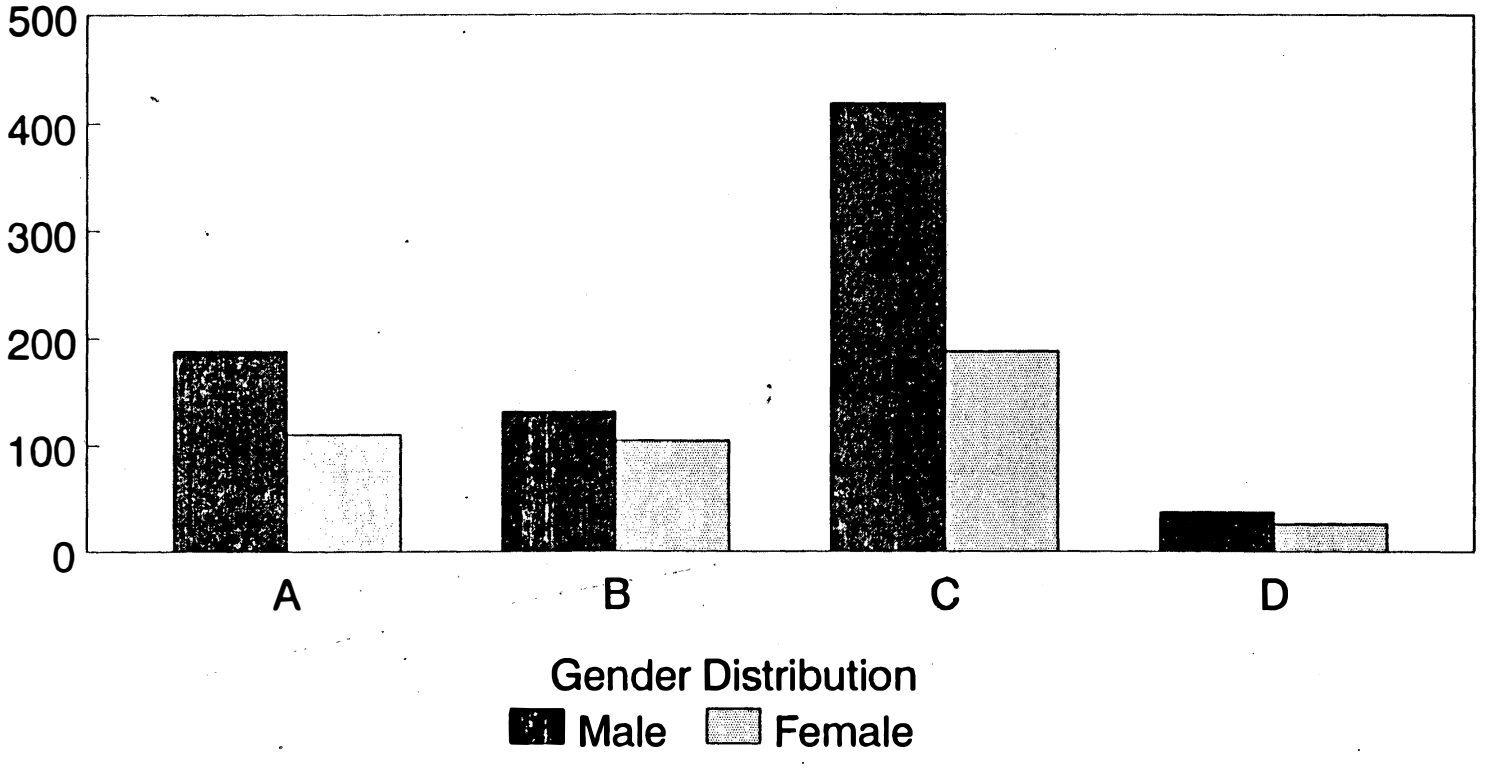
RESPONDING ORGN BY ORGN TYPE/STATUS



A – Government B – Parastatal C – Pvt Local D – Private Foreign

Attach #4

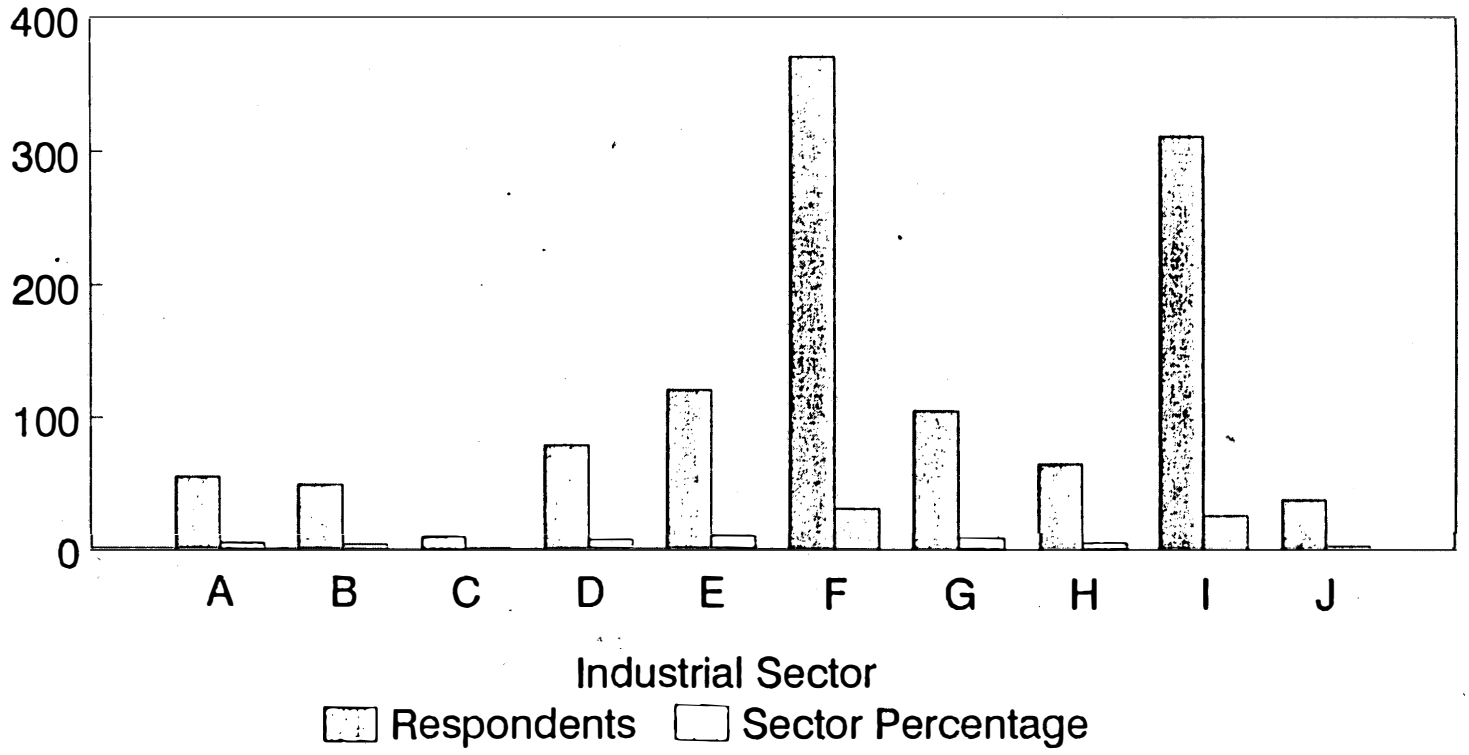
GENDER DISTRIBUTION BY ORGN TYPE/STATUS



A – Government B – Parastatal C – Pvt Local D – Foreign

Attach #5

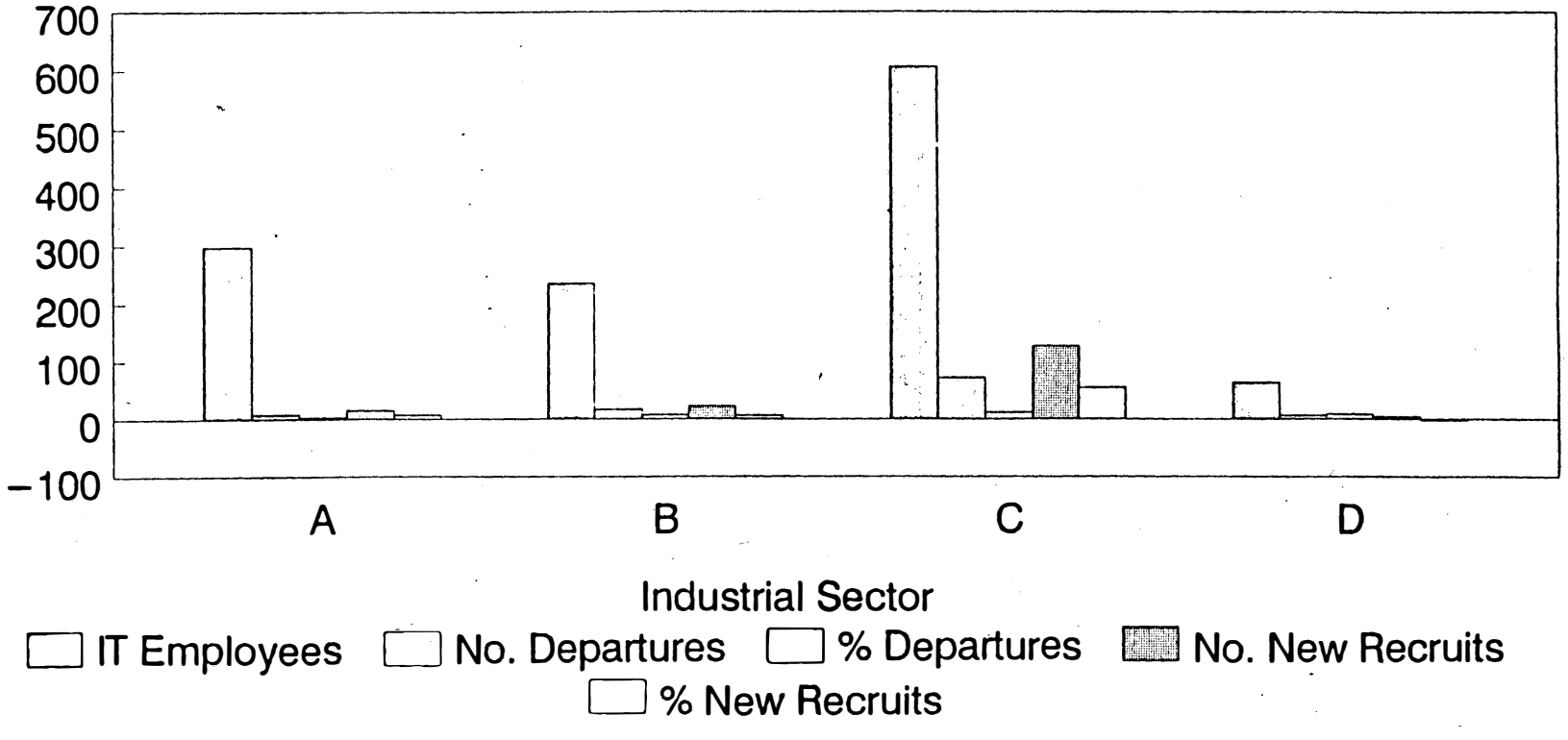
RESPONDING ORGANISATIONS BY SECTOR



A – Agriculture B – Mining C – Manufacturing D – Commerce E – Communications
F – Business Serv. G – Banking & Finance H – Education I – Public Admin. J – Other

Attach #6

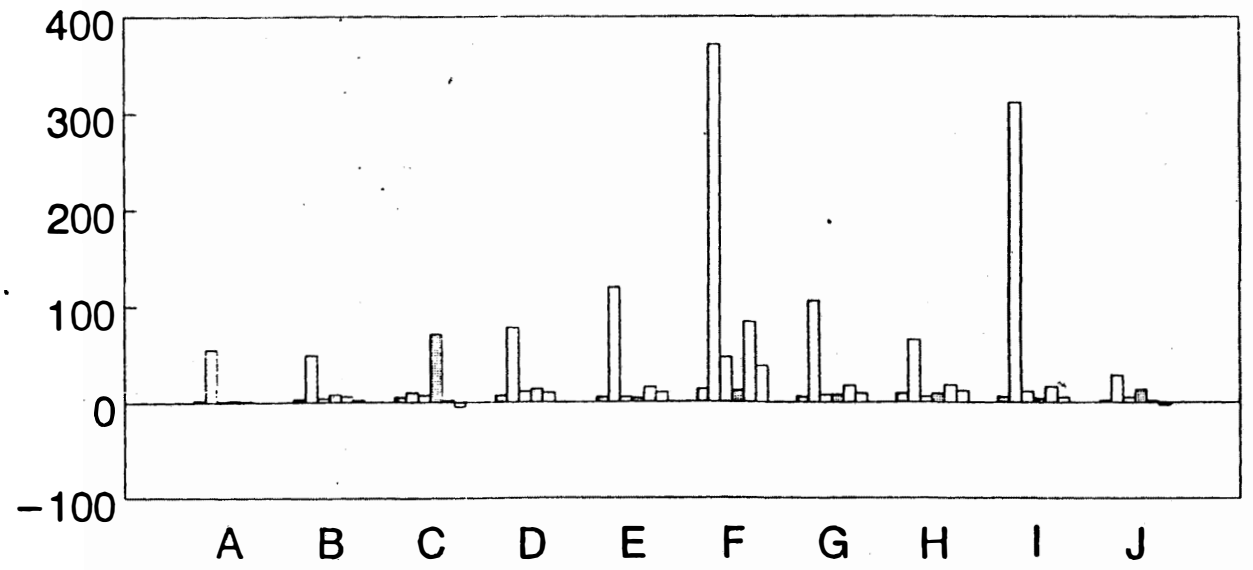
STAFF TURNOVER BY ORGN TYPE/STATUS



A – Government B – Parastatal C – Pvt Local D – Pvt Foreign

Attach #7

STAFF TURNOVER BY IND. SECTOR



A – Agriculture B – Mining C – Manufacturing D – Commerce E – Communications
F – Business S&G – Banking & IH – Education I – Public Admin.J – Other

ATTACHMENT #8.1

HIGH

With indepth understanding of not just the hardware but the operating systems as well as other software. One should be able to diagnose and test to determine the exact nature of a problem, develop strategies and solve it whether it be a hardware or software one.

MIDDLE

Has a well developed theoretical and practical understanding of how computers and their subassemblies work and should have well developed diagnostic and testing abilities.

LOW

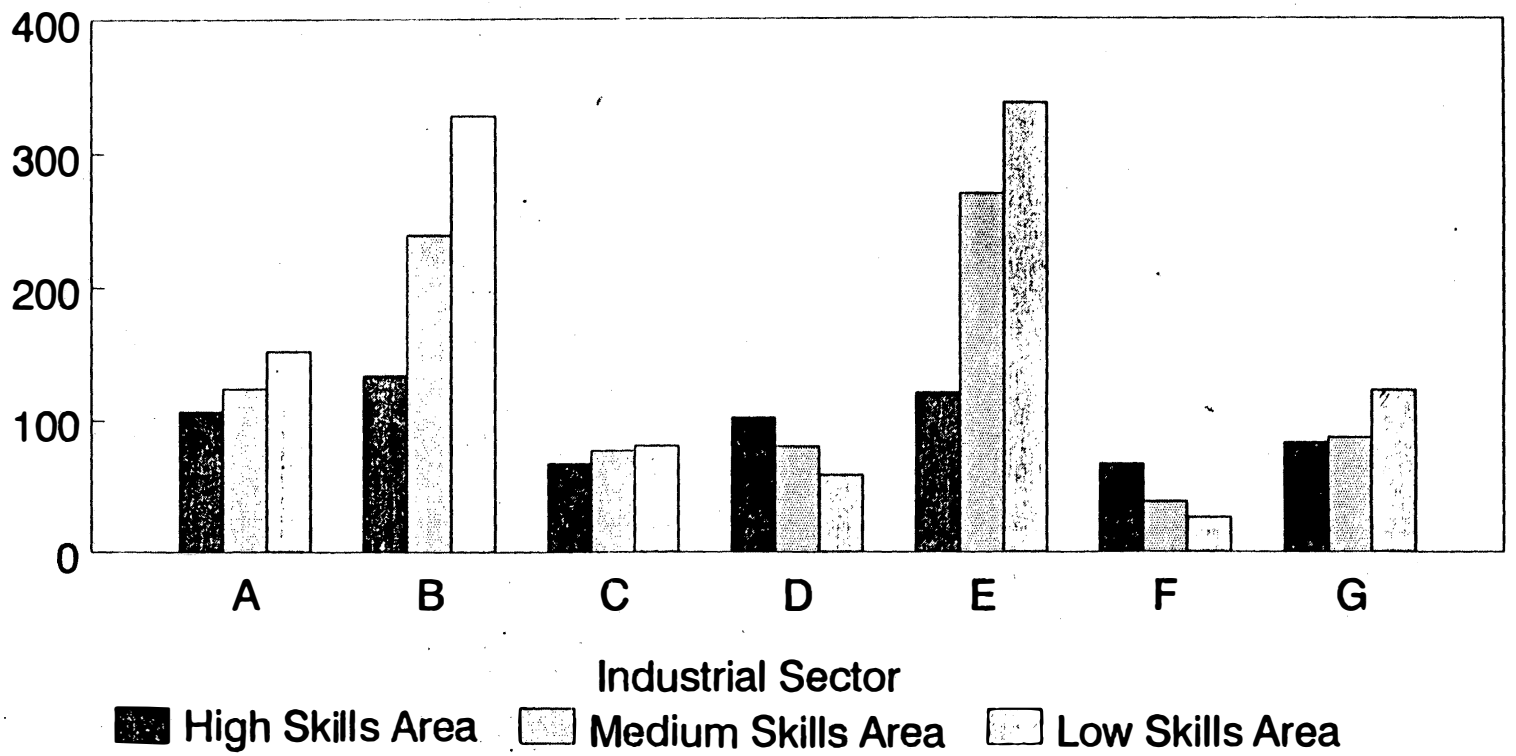
Has had quality training in theory and practical skills associated with computer technology. Understands something significant about how computers and their operating systems work as well as how to use knowledge to maintain them. They have advanced from trainee status.

TRAINEE

Has little theoretical training but mastered practical skills associated with computer technology or vice versa.

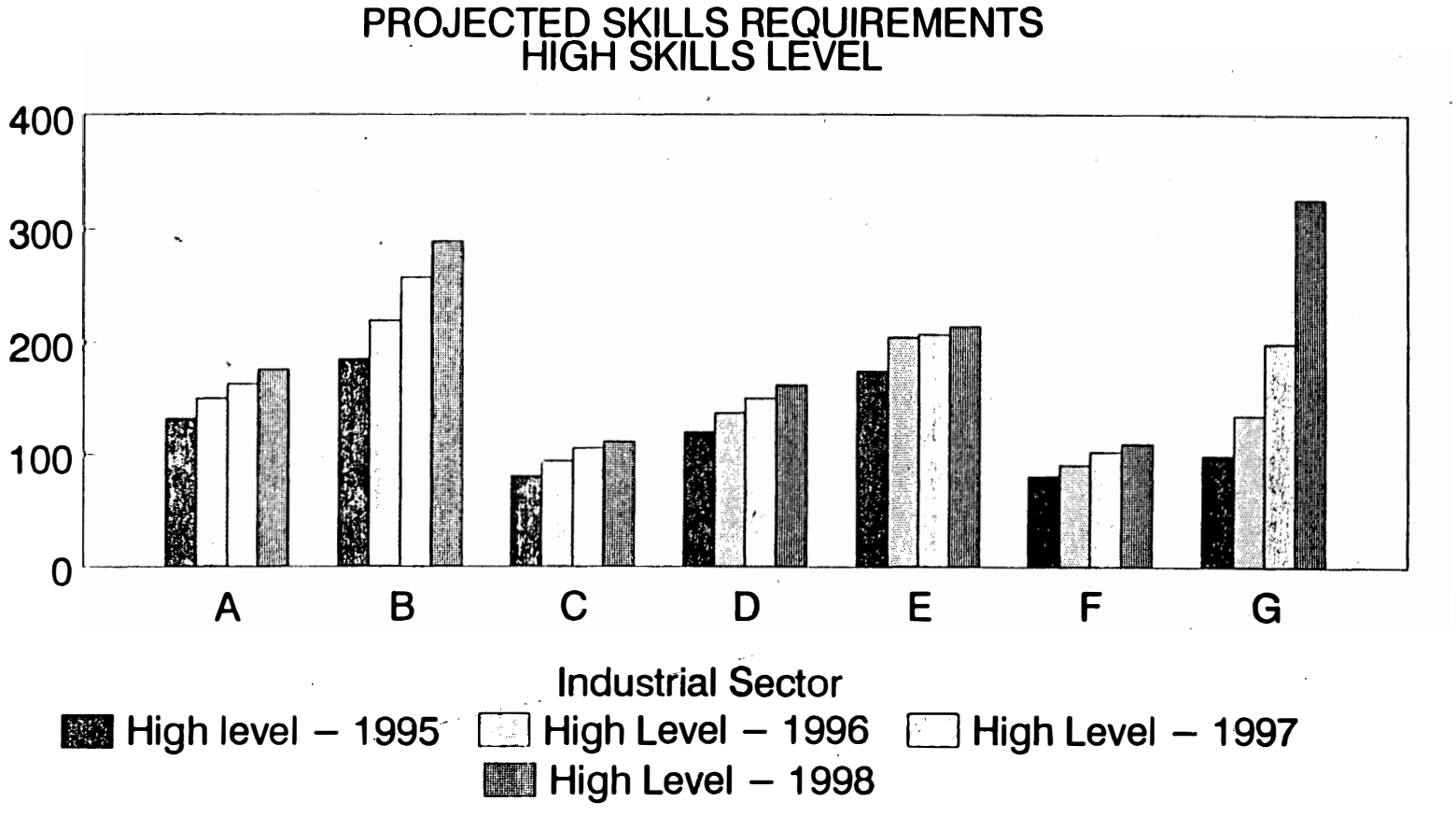
Attach #8.2

SKILLS DISTRIBUTION BY AREA & LEVEL '94



A – Software & Prog. B – Bus. Applications C – Computer H/W D – Info. Systems E – DP Operations
F – Specialist Areas G – Adjunct Skills

Attach #9



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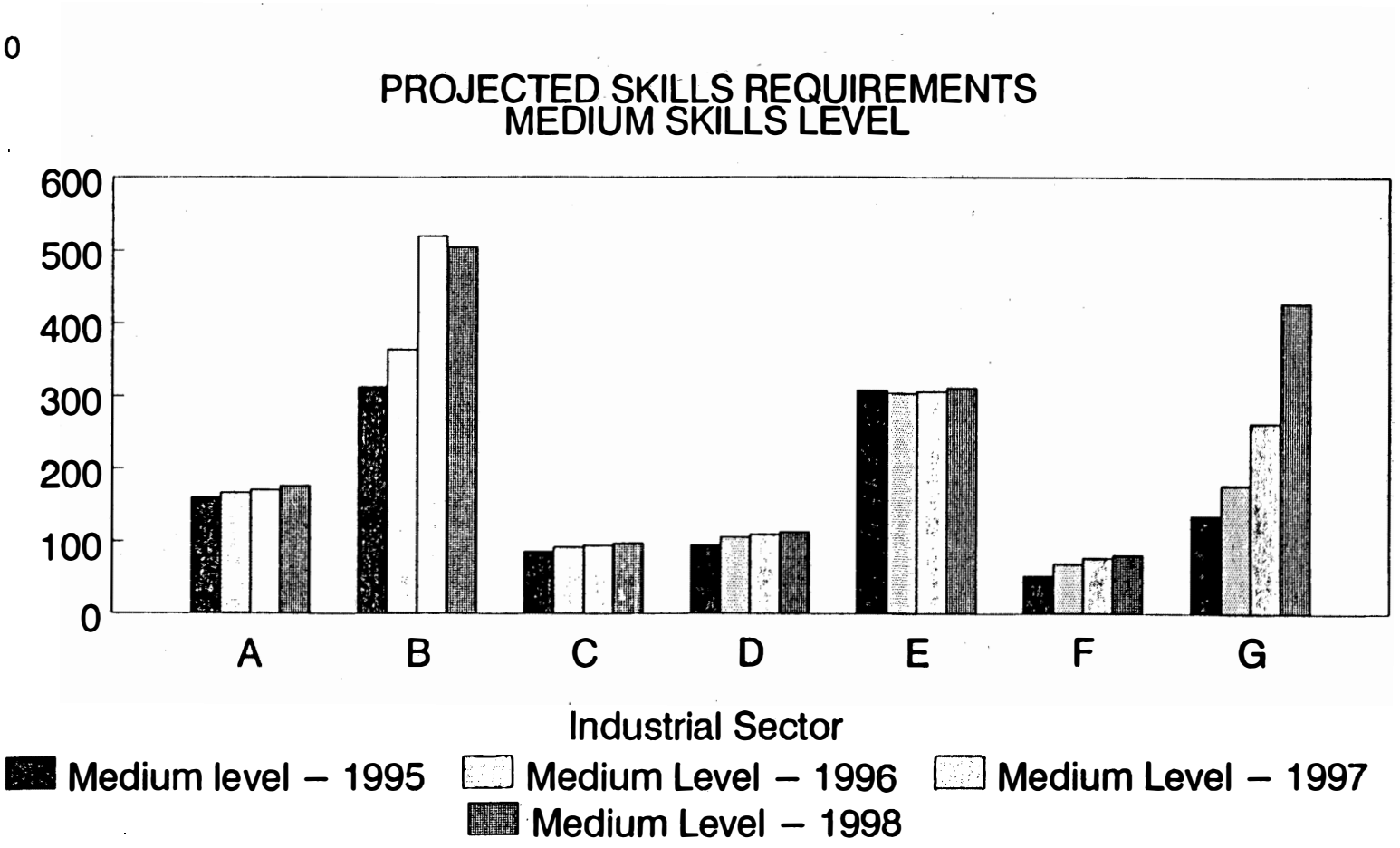
F – Specialist Areas G – Adjunct Skills

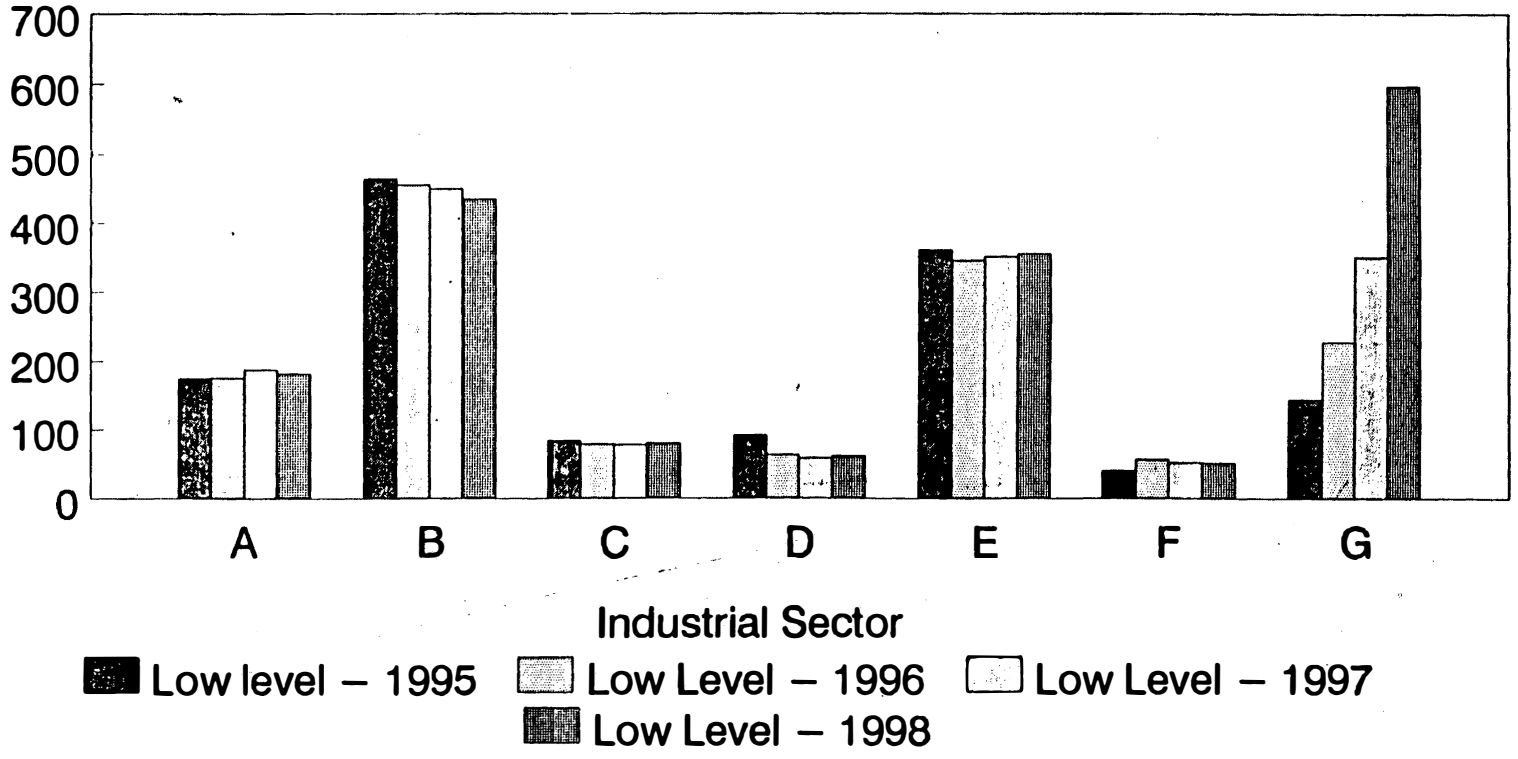
Attach #10



A – Software & Prog. B – Bus. Applications C – Computer H/W D – Info. Systems E – DP Operations
F – Specialist Areas G – Adjunct Skills

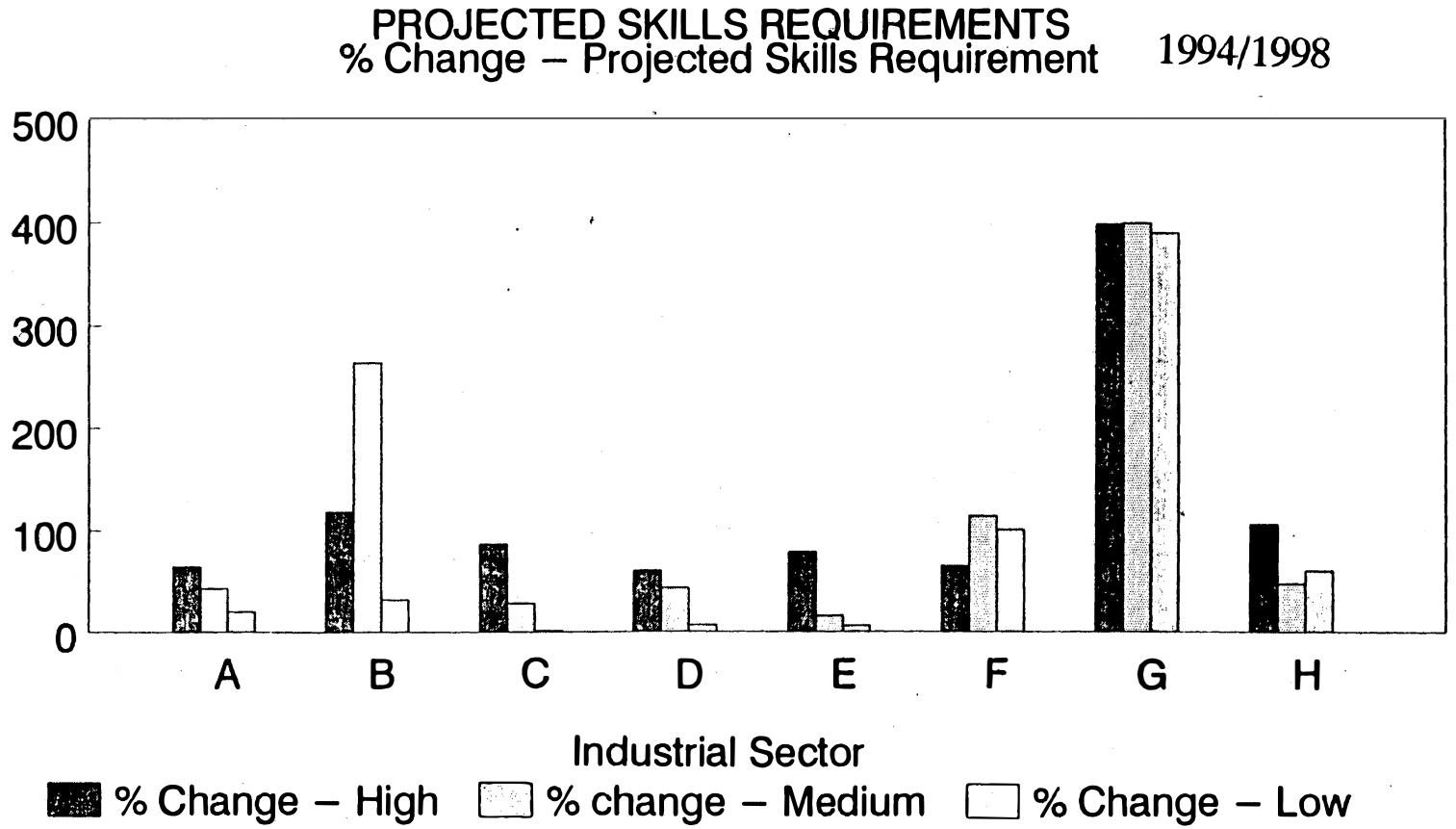
Attach #11

PROJECTED SKILLS REQUIREMENTS
LOW LEVEL SKILLS



A – Software & Prog. B – Bus. Applications C – Computer H/W D – Info. Systems E – DP Operations
F – Specialist Areas G – Adjunct Skills

Attach #13



A – Software & Prog. B – Bus. Applications C – Computer H/W D – Info. Systems E – DP Operations
F – Specialist Areas G – Adjunct Skills H – Totals